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I, KIM MARSHALL, MANAGER EXAMINATION SUPPORT AND SALES, hereby certify that the annexed is a true copy of the Provisional specification in connection with Application No. PP 0967 for a patent by PETER BILOWOL filed on 18 December 1997.

WITNESS my hand this Eighth day of January 1999

KIM MARSHALL
MANAGER EXAMINATION SUPPORT AND SALES

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AUSTRALIA

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PROVISIONAL SPECIFICATION

Invention Title: A Frame Unit, System and Method for use in Constructing a Structure

The invention is described in the following statement:

GH REF: P50666A:CLC:SB

A FRAME UNIT, SYSTEM AND METHOD FOR USE IN CONSTRUCTING A STRUCTURE

The present invention relates to the building industry.

Primarily the invention relates to building structures which are formed using concrete.

A typical method for constructing a building requires formwork to be provided in the shape of a wall and so as to allow concrete to be poured between the panels of the formwork and allow the concrete to set and thus form a wall.

As an example, formwork to construct a wall involves providing a number of rows of upright steel reinforcing rods which extend from a base support structure, connecting horizontal steel rods to the upright rods to form a channel between adjacent upright rods of each row and then connecting forming panel work such as plywood to the reinforcing rods so that side walls to the channel are provided and to enable concrete to be poured into the channel. When the concrete has set the formwork is removed thus providing a concrete wall.

Although the method described above for constructing a wall would appear to be relatively straight forward, complications arise in providing accurately dimensioned structures. Thus the width of a wall constructed using the above method can vary depending upon the accuracy of the location of reinforcing rods and panel formwork. In general all components required during construction of formwork must be accurately measured in order to achieve the desired dimensions of the finished structure.

In addition to the above whenever structures which include irregularities are required much care and attention must be taken in constructing the formwork for this applications. Thus a wall which requires a bevelled end face or curves or lintels generally increases the labour required in constructing the desired formwork.

The present invention provides an alternative to the conventional methods for constructing structures as

described above.

According to one aspect of the present invention there is provided a frame unit for use in construction formwork comprising a plurality of frame components including first and second frame components and connection means for connecting frame components together to form an assembled frame; wherein a plurality of frame units are arranged to be assembled to form formwork for a wall.

Preferably the frame unit includes reinforcing means for strengthening a wall formed using the frame unit.

The first frame component may comprise a first wall section.

Preferably the second frame component comprises a second wall section.

Each frame component may comprise an elongate member.

Preferably each elongate member is configured to form a continuous loop of a predetermined shape.

The predetermined shape may be rectangular, square, triangular or any other shape required to form a structure.

Each elongate member may be configured to form a wall frame.

Each frame component may be assembled to form a unit having side and end walls.

Preferably the first frame component forms a side wall of the assembled frame.

The second frame component may form an end wall of the assembled.

Preferably the assembled unit comprises two first frame components and two second frame components.

Preferably the frame unit is in the form of a skeletal frame of a building block.

It is preferred that the reinforcing means includes a plurality of elongate elements.

The reinforcing means may include a plurality of elongate elements connected to form a grid pattern.

The frame components may be assembled with at least part of the reinforcing means extending therethrough.

It is preferred that the reinforcing means is a planar mesh formed from crossing elongate elements.

The frame components may be assembled with the reinforcing means located between side wall frame components and extending upwardly and downwardly therebetween.

The reinforcing means may comprise vertical and horizontal rods welded to form a mesh.

Preferably the reinforcing means comprises a plurality of metal grids.

The metal grids are preferably arranged in parallel with predetermined spacing therebetween.

It is preferred that the end wall frame components are arranged to abut with respective upright elongate elements of the reinforcing means.

The end wall frame components may be arranged to abut with respective horizontal elongate elements of the reinforcing means.

According to one embodiment frame components of the frame unit are angled with respect to a vertical plane.

It is preferred that the connection means comprises an elongate connection member and at least one fastening means for connecting frame components thereto.

It is preferred that the connection means interconnects two frame components.

The connection means may comprise a plurality of elongate connection members each adapted to be connected to a plurality of frame components with the fastening means.

It is preferred that each elongate connection member extends between adjacent corners of frame components.

The mesh may be connected to frame components.

It is preferred that the elongate connection members comprise horizontal rods which are arranged to run in parallel with the top and bottom horizontal parts of the end frame components.

Preferably the elongate connection members are connected by clips to the corners of the frame unit.

The clips may be spring clips.

It is preferred that the ends of the elongate connection members extend beyond the corners of the frame unit.

The fastening means may include wire which is used to connect the elongate connection members to the frame unit. Alternatively the fastening means may be an adhesive or fibreglass or any other suitable means for fastening the elongate connection members to the frame unit.

According to one embodiment the frame unit is assembled to form a cage.

According to another embodiment the elongate connection members have threaded ends which are arranged to receive threaded nuts.

The elongate connection members may include spacers which are receivable thereon.

The elongate connection members may be arranged to be connected to the mesh of the reinforcing means.

According to another embodiment the elongate connection members comprise round hollow plastic tubes through which a metal bolt can be placed.

According to another embodiment the frame unit includes a plurality of panels adapted to be connected to the assembled frame.

Each panel may have a predetermined shape.

Each panel may comprise openings for receipt of ends of the elongate connection members.

Preferably each panel comprises coupling means for coupling adjacent panels together.

The panels preferably comprise openings through major faces thereof.

The coupling means may be male or female portions which are adapted to couple with matching male or female portions of another frame unit.

It is preferred that the male or female portions

consist of holes and spigots, or alternatively channels and spigots.

The panels may form side walls of the frame unit.

Ends of the elongate connection members may be secured by attachment means such as nuts and clips to the panels.

At least one hole is provided through each panel and an attachment means is arranged to be located at the end of the elongate connection members to secure each panel to the frame unit.

Each coupling portion is preferably located on an edge face of the panel.

The panels may be plastic, plywood, steel or cardboard.

According to one embodiment the panels are made of cardboard and have flaps which are arranged to be connected to flaps of other panels in lieu of a coupling means.

It is preferred that the panels are removable and/or reusable.

The coupling means preferably provides rigidity to a plurality of assembled frame units.

It is preferred that spacers for the elongate connection members are used to separate the panels from adjacent frame components.

It is preferred that end portions of the reinforcing means extend into adjacent frame units so as to overlap end portions of reinforcing means of other frame units.

It is preferred that a plurality of reinforcing means are provided for each frame unit.

Where there is a plurality of reinforcing means it is preferred that these are arranged in a parallel layered arrangement.

According to another embodiment of the present invention there is provided a method of constructing formwork for a building structure comprising the steps of forming a frame unit by connecting a plurality of frame components together using a connection means to form an

assembled frame with openings to allow for entry of a settable substance, providing a reinforcing means and connecting the reinforcing means to the frame unit and connecting panels to the frame unit to form a module which is movable to be connected to another module.

Preferably each module comprises coupling means for enabling modules to be coupled together.

It is preferred that the step of connecting the plurality of frame components together includes connecting elongate members across adjacent frame components.

The step of connecting the plurality of frame components together preferably includes providing a plurality of frame components of a predetermined shape and arranging the frame components to form a frame of a predetermined shaped.

It is preferred that the frame unit has a three dimensional shape.

Preferably each frame component comprises a loop of steel.

The frame component may be a hoop component.

The frame component may be annular.

It is preferred that the frame component comprises an elongate element configured to a predetermined shape.

According to another aspect of the present invention there is provided a panel having major faces and edge faces with openings through the major faces adapted to receive ends of elongate members and coupling means for coupling panels together.

It is preferred that the coupling means are located on the edge faces.

According to another aspect of the present invention there is provided a system for constructing a building structure including a plurality of modules each including a frame component.

A preferred embodiment of the present invention will now be described by way of example only with reference to the accompanying drawings in which:

Figure 1 shows a reinforced steel formwork frame according to a first embodiment of the present invention;

Figure 2 shows a reinforced steel formwork frame according to a second embodiment of the present invention;

Figure 3 shows the formwork frame of Figure 1 with panel support ties according to a first embodiment;

Figure 4 shows a front view of a panel support tie shown in Figure 3;

Figure 5 shows a perspective view of a formwork frame with panel ties according to a second embodiment of the present invention;

Figure 6 shows one support tie according to the second embodiment connected to two frame elements;

Figure 7 shows two panels according to a first embodiment;

Figure 8 shows one of the panels shown in Figure 7;

Figure 9 shows a panel according to a second embodiment of the present invention;

Figure 10 shows a liner for the panel shown in Figure 9;

Figure 11 shows a schematic diagram of similar panels connected together;

Figure 12 shows male and female couplings for connecting panels together;

Figure 13 shows a finished module according to a first embodiment of the present invention;

Figure 14 shows an end elevation of a number of vertically stacked modules;

Figure 15 shows a section of wall according to a first embodiment;

Figure 16 shows a formwork frame for corner forms according to a first embodiment of the invention;

Figure 17 shows a formwork frame according to a third embodiment; and

Figure 18 shows a formwork frame according to a fifth embodiment.

According to the preferred embodiment of the present

invention formwork for building structures is simplified by making modules which can be connected together. A single module is made from a number of unique components.

As shown in Figure 1 a formwork frame 11 is constructed from a number of base elements which in this embodiment consist of two rectangular side wall frame elements 12, 13 and two rectangular end wall frame elements 14, 15. Each frame element is formed from a steel rod which is bent into a rectangular shape and welded at its end to form a continuous loop. A steel reinforcement mesh 16 is provided and in this embodiment in a vertical orientation between the side wall frame elements 12 and 13 with three upright rods 17, 18, 19. The frame elements 12, 13, 14 and 15 are assembled to form a box like frame structure with the reinforcing mesh 16 located with upright rods 17 and 19 in abutment with the end walls 14 and 15 and located approximately mid way between side framework elements 12, 13.

In the second embodiment of the invention shown in Figure 2 two reinforcement meshes 20, 21 are provided side by side and parallel to each other so that there is a small space between them. According to other embodiments of the invention additional reinforcement meshes may be provided and also reinforcements of a different configuration.

With the frame elements 12, 13, 14, 15 assembled as in Figure 1 they must be connected together to form a single box like frame 30. As shown in Figure 3 these components may be connected together using wire but it is preferred to use panel support ties 31 which as shown in Figure 4 consist of rod elements which are arranged to lie co-terminus with the horizontal sections of each of the end wall frame elements 14, 15. The ends of the support ties 31 are provided with a threaded section 32, 33.

Clips 34 are provided to connect the support ties to the adjacent horizontal walls 35, 36, 37, 38 of the end frame elements 14, 15.

The clips 34 may be any suitably designed clip which is able to connect two rod-like components together.

The support ties 31 also include spacer elements 39, 40 which enable a separation to be achieved between side frame elements 12, 13 and end wall elements 14, 15.

Figure 4 also shows how vertical sections 41, 42 of the side frame elements 12, 13 can be connected to the clips 34. The clips 34 may include two socket elements having resilient finger elements which are able to grip the vertical sections 41, 42 and the horizontal sections 35, 36, 37, 38.

According to an alternative embodiment shown in Figure 5 and Figure 6 panel support ties 50 consist of round hollow plastic tubes which are also aligned horizontally co-terminus with the vertical sections of the end frame elements 14, 15. Each support tie 50 is connected to the corners of each side frame element 12, 13 by using either clips 51 or by tying the tubes 50 using wire. Alternatively adhesive tapes may be used or even fibreglass may be used to bind the tubes to the side frame elements 12, 13.

A steel bolt can be inserted through the tubes 50 to provide strength to the plastic tubes so as to hold panels together and also hold the frame elements together thus acting as spacers.

Figure 7 shows two panels 60, 61 which are fed onto the respective ends 62, 63 of support ties 31, 50. In Figure 7 only the end 63 of the support ties 31, 50 are shown.

An individual panel 60, 61 is shown in Figure 8 more clearly and consists of a planar element having an inside major face 64 and an outside major face 65. The panel also has vertical edge faces 66 and horizontal edge faces 67 to form a substantially rectangular slab.

Each major face 64, 65 has four openings 68 provided in a symmetrical pattern close to respective corners of the panel 60, 61.

Each panel could be made from steel for reusable

purposes, from plastic, plasterboard or even a cardboard version is possible as shown in Figures 9 and 10. The panel can also be formed with one of the major faces being recessed with respect to the edge faces so as to be able to receive a liner which can have a specifically configured major face so as to leave a textured effect or pattern on concrete with which it contacts.

Each of the edge faces 66, 67 is provided with coupling portions 69 which in Figure 8 are shown as holes. As shown in Figure 11 however the edge faces are preferably provided with dowels in one edge face and correspondingly shaped holes in the opposing edge face. This enables adjacent panels to be connected together with the dowels of one panel connecting with the holes of an adjacent panel 73.

On the horizontal edge faces 67 especially shaped dowel 74 may be provided as shown in Figure 12 which has a small vertical portion and its major portion running horizontally. The opposite edge face of the panel 72 is provided with a protruding cylindrical socket 75 which is adapted to receive the horizontal portion of the dowel 74.

In an alternative embodiment shown in Figures 9 and 10 the panels may be made of a sheet of cardboard 79 with holes 80 provided in a similar configuration to the previous embodiment. A cardboard liner 81 is provided having a matching major face 83, but with peripheral rectangular flaps 84.

The panel 79 is stapled to the major face 83 of the liner 82 and the flaps 84 can be connected to flaps of adjacent panels so that panels can be connected together.

It is preferred that the panel 79 is stapled to the liner 83 and that flaps of adjacent panels are also stapled together.

Figure 13 shows a finished module which has rectangular panels 91 connected to the ends of support ties 93 with nuts 94 screwed onto the ends of the ties 93 to fix the panels in position in a vertical orientation

on either side of the inside frame 95. As shown the spacers 96 separate the panels 91 from the frame 95.

Figure 13 shows how the ends of the reinforcement mesh 92 extend above, below and beyond the side walls of both the frame 95 and the panels 91.

In Figure 14 three finished modules 100, 101, 102 are stacked vertically and the reinforcement mesh of each module is shown as 103, 104 and 105. The lowermost limit of the reinforcement mesh 103 of module 100 extends almost as far as the top reinforcement mesh 105 of the bottom most unit 102, while the middle unit 101 has its reinforcement mesh 104 spaced from the other two reinforcement meshes 103, 105, but in parallel to both of these meshes, thus providing a continuous vertical reinforcement from one module to the next.

As shown in Figure 15 a wall may be assembled by having a series of modules connected together in a similar fashion to how bricks would positioned in a wall. It should be noted however that where it is necessary to construct a corner or an end to the wall, modules of different shapes are required, thus a half module 111 is required in the lowermost section of the wall at one end thereof and a corner module 112 is required at the opposite end of the wall in the second layer. Thus as shown in Figure 16 a corner module is made from frame elements which are connected together to form a right angled block frame with panel support ties being connected across opposing side frame elements and in addition one support tie being connected to the reinforcing mesh which is opposite the side frame element near the outermost corner.

As shown in Figure 17 a curved wall may be formed by having one of the side frame elements shorter than the other. Thus when adjacent modules are connected together one module will need to be angled with respect to the next so that the ends of each module abut.

A further embodiment of the invention shown in Figure 18 includes panels having a triangular

configuration.

Other embodiments of the present invention are also covered by the invention and include panels which have one, two or three holes and which thus may be one quarter, one half or three quarters of a standard module which is shown in Figure 13.

According to another embodiment of the present invention a module may be formed having a round shape so that the frame elements may be formed from a series of rings which are connected together using the aforementioned techniques. In such a case a curved panel would be required.

Variations and modifications can be made in respect of the invention described above and defined in the following statement of claims.

1. A frame unit for use in construction formwork comprising a plurality of frame components including first and second frame components and connection means for connecting frame components together to form an assembled frame; wherein a plurality of frame units are arranged to be assembled to form formwork for a wall.

2. A method of constructing formwork for a building structure comprising the steps of forming a frame unit by connecting a plurality of frame components together using a connection means to form an assembled frame with openings to allow for entry of a settable substance, providing a reinforcing means and connecting the reinforcing means to the frame unit and connecting panels to the frame unit to form a module which is movable to be connected to another module.

Dated this 18th day of December 1997
PETER BILOWOL
By his Patent Attorney
GRIFFITH HACK

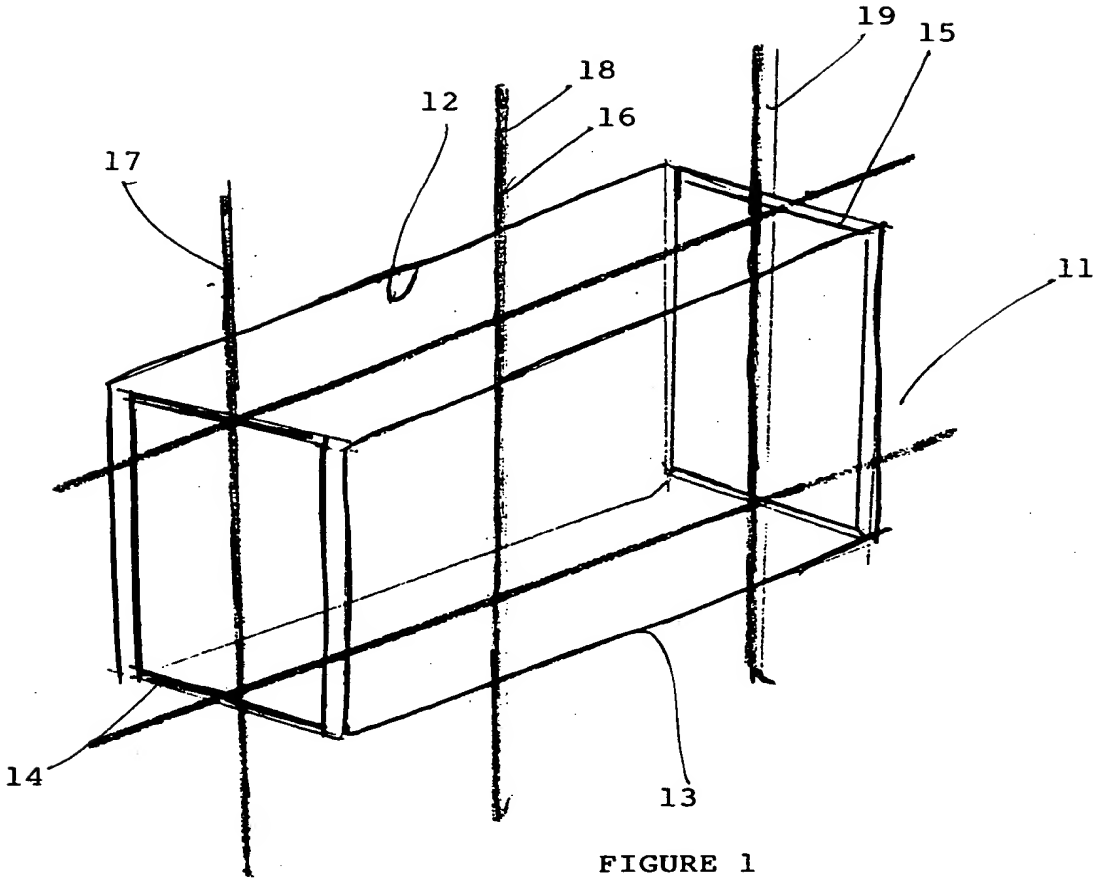

FIGURE 1

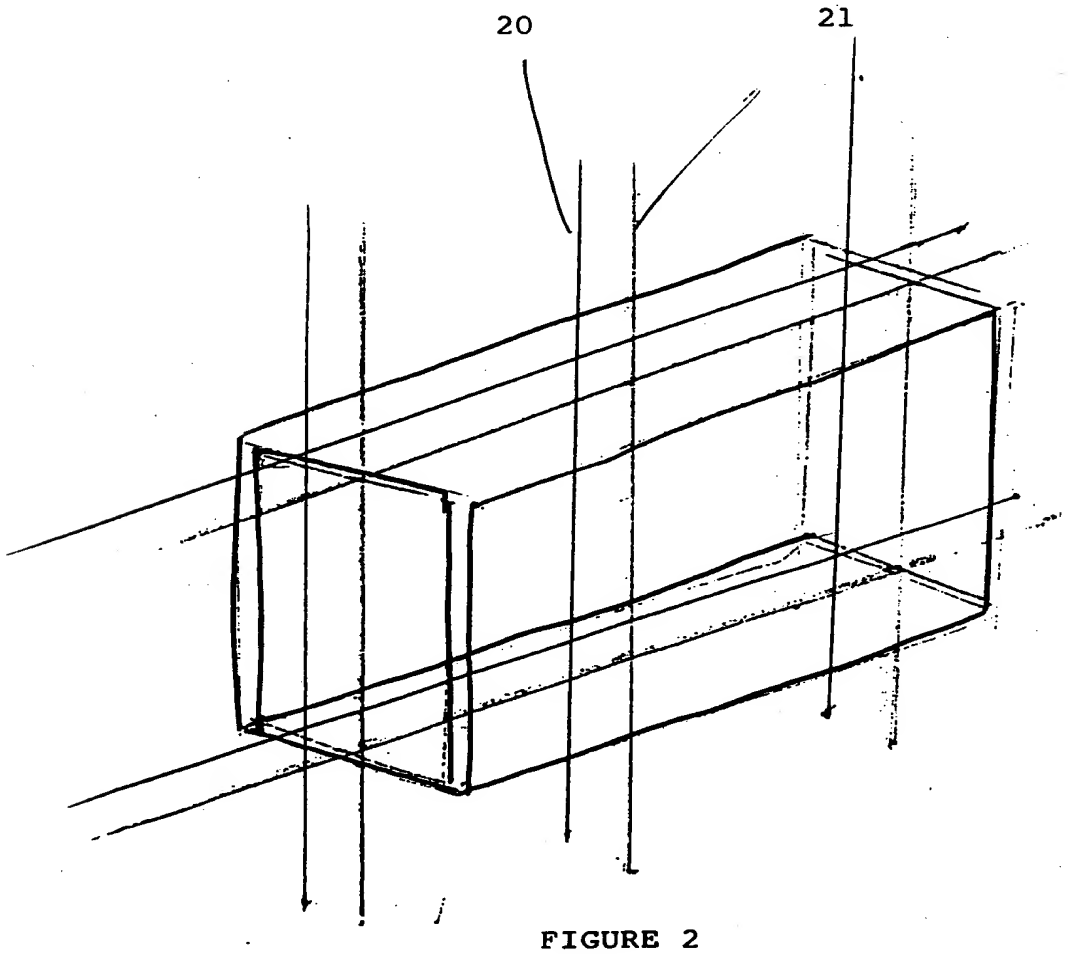

FIGURE 2

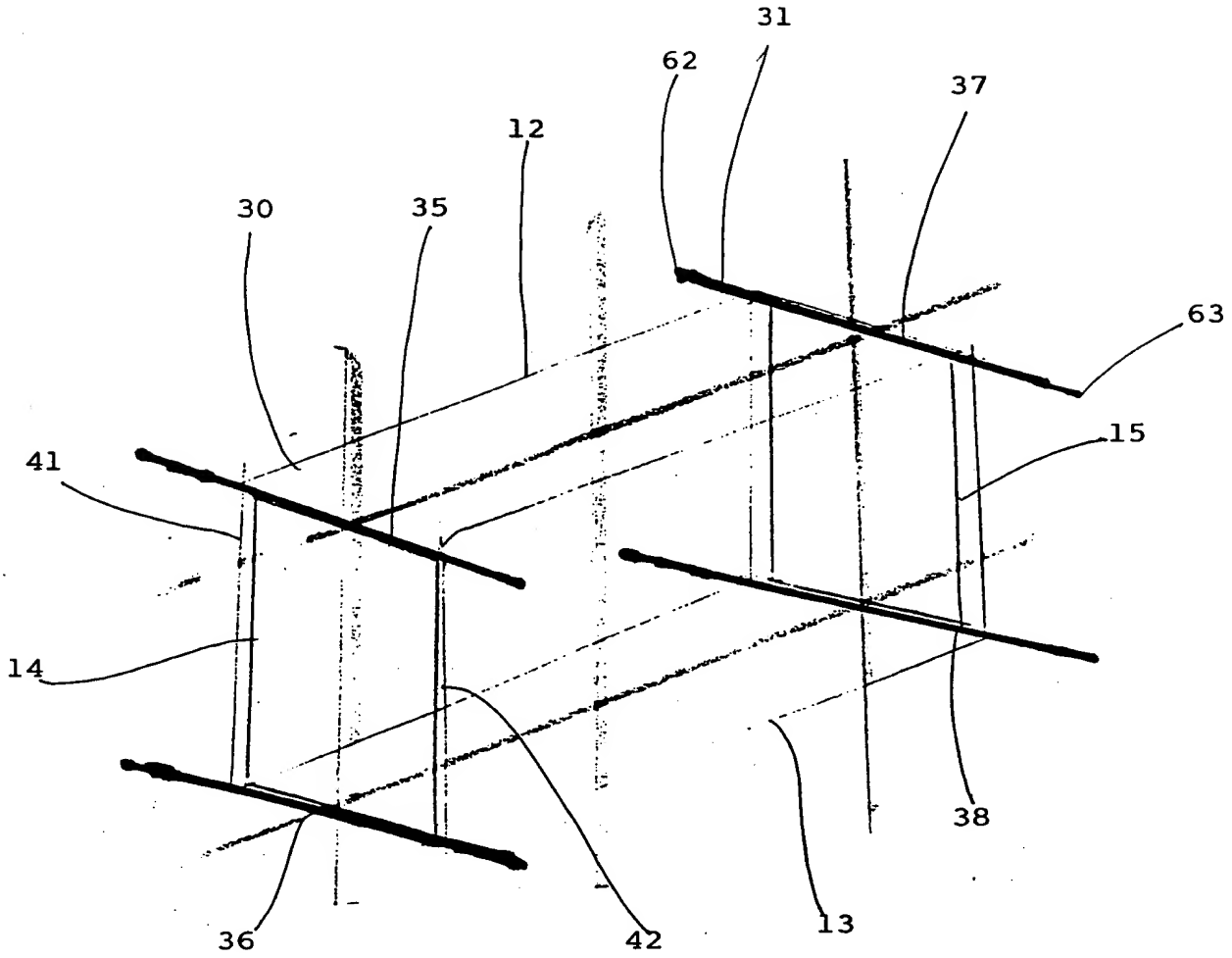

FIGURE 3

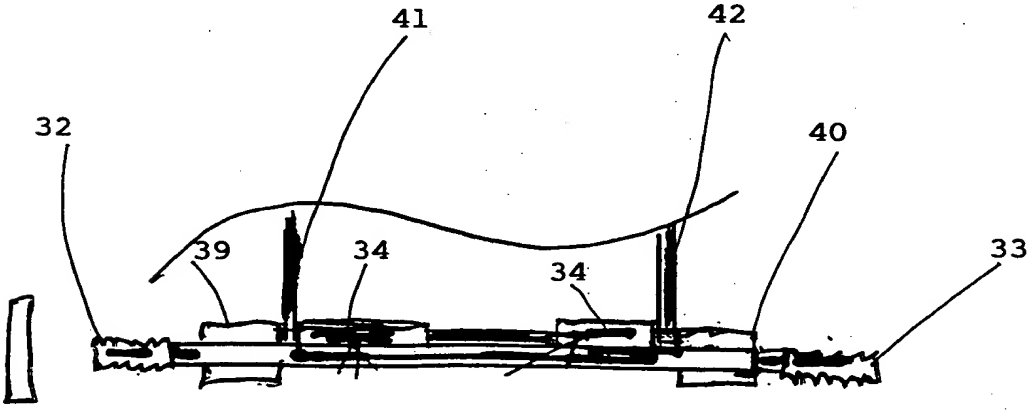

FIGURE 4

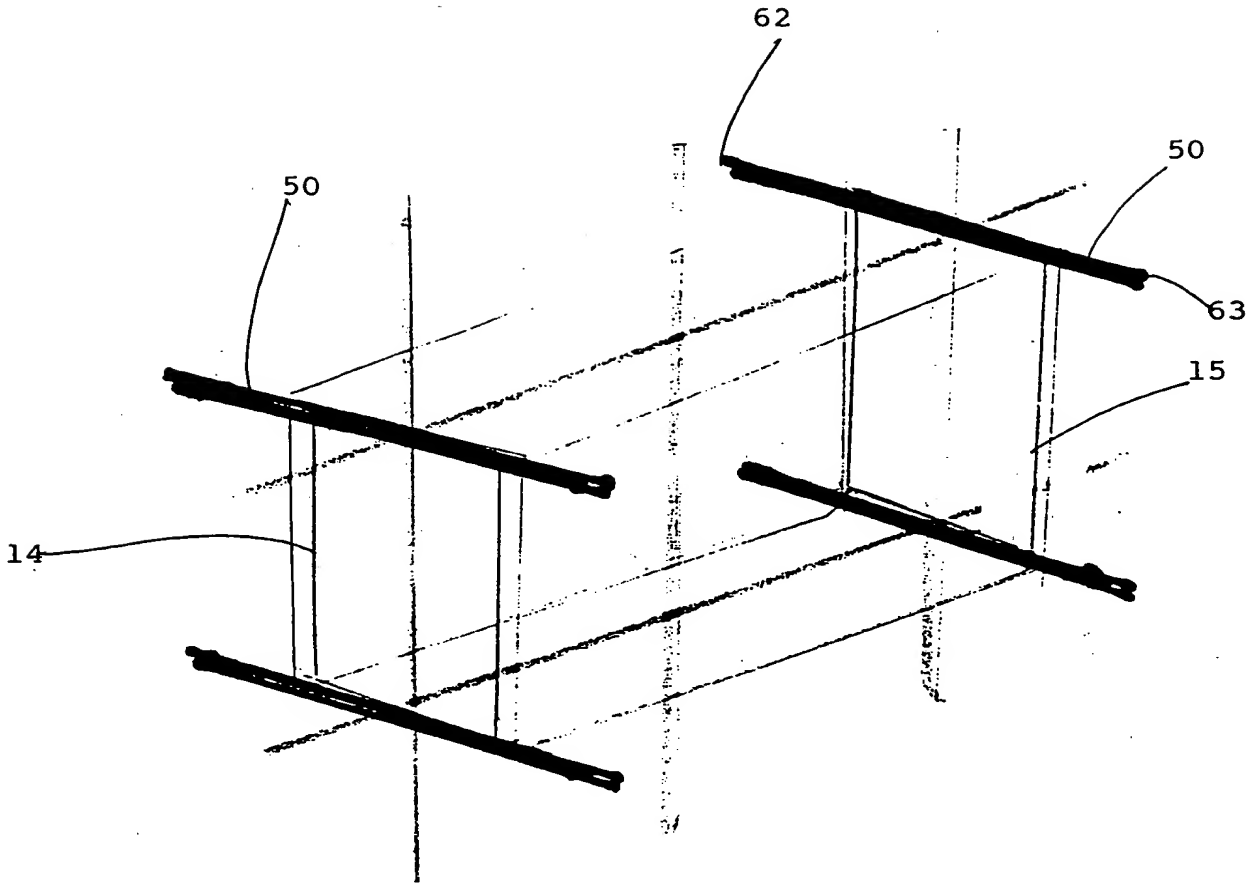

FIGURE 5

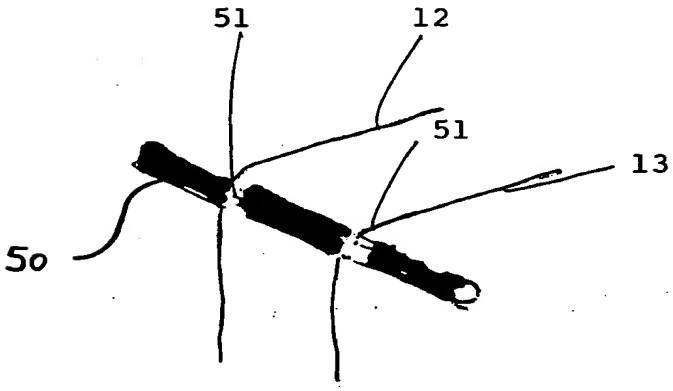

FIGURE 6

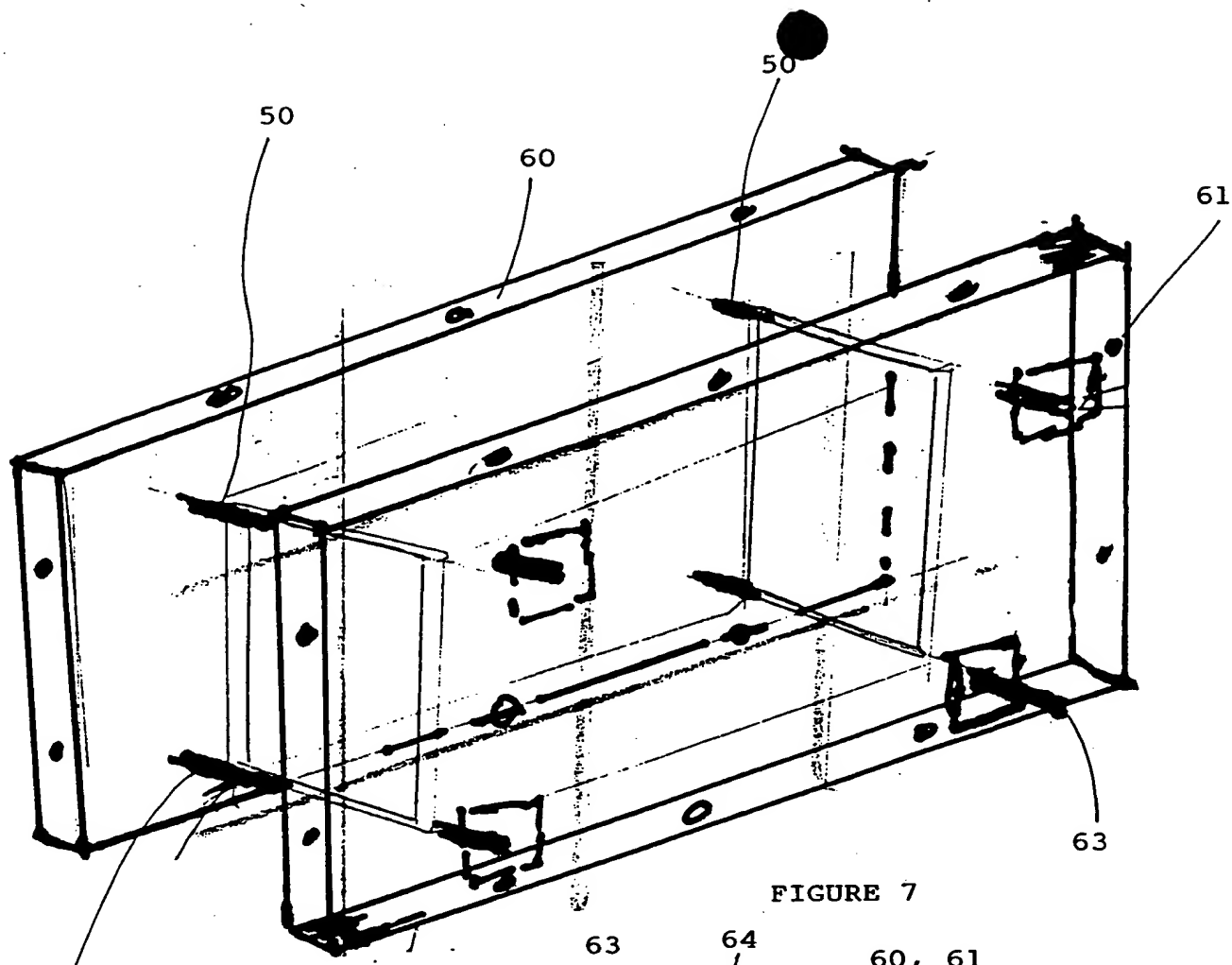

FIGURE 7

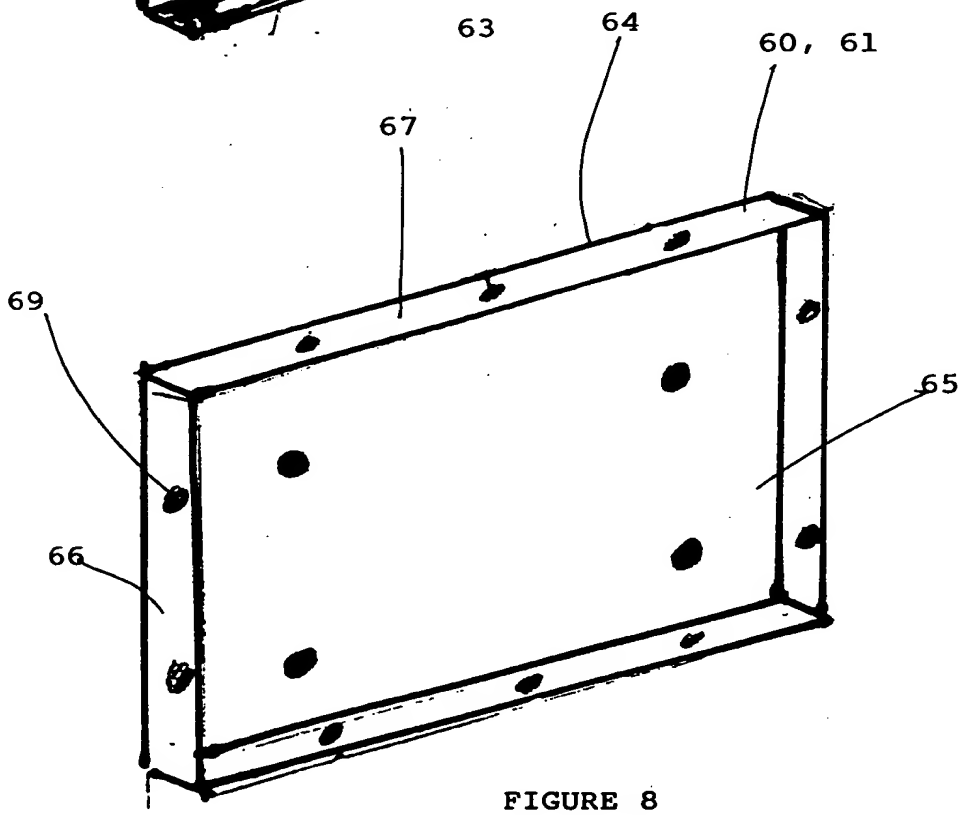

FIGURE 8

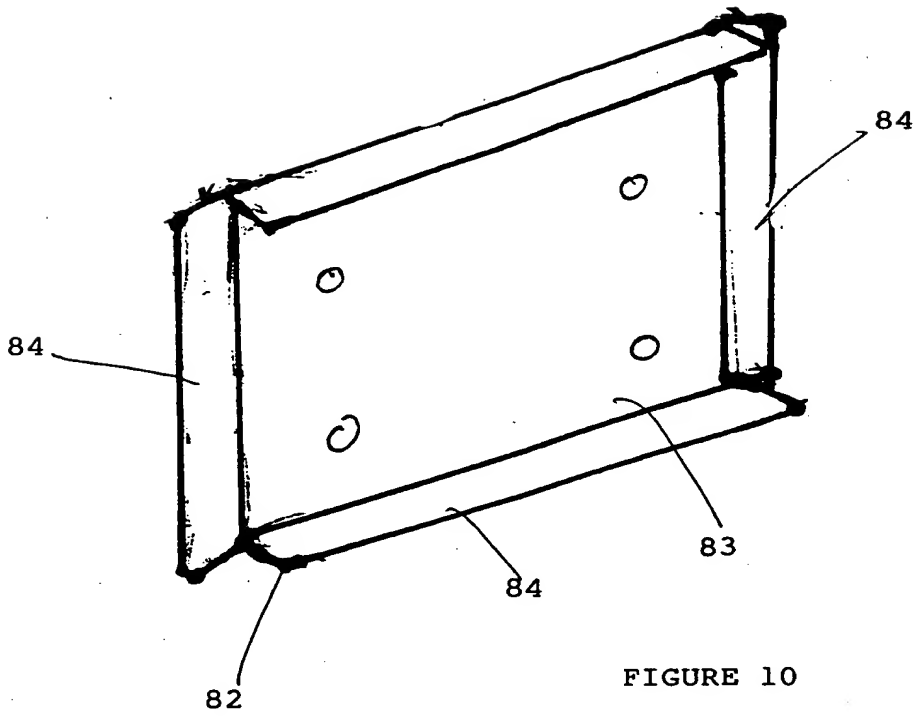

FIGURE 10

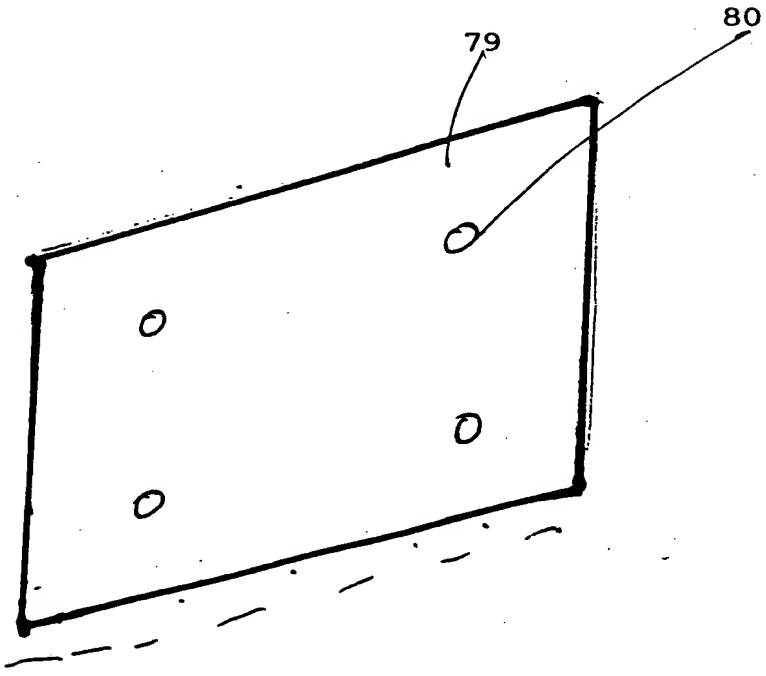

FIGURE 9

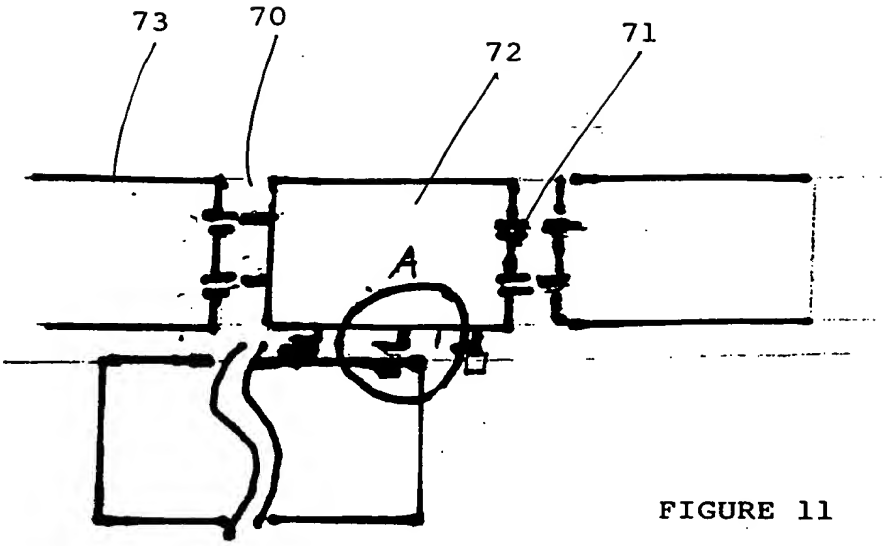

FIGURE 11

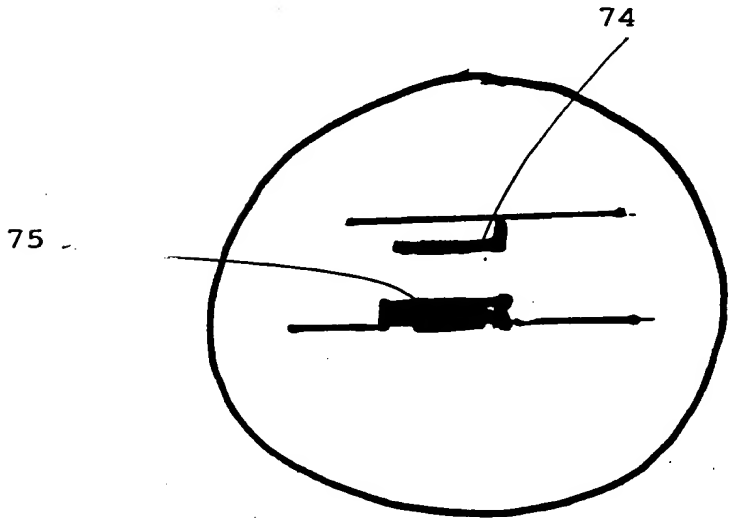

FIGURE 12

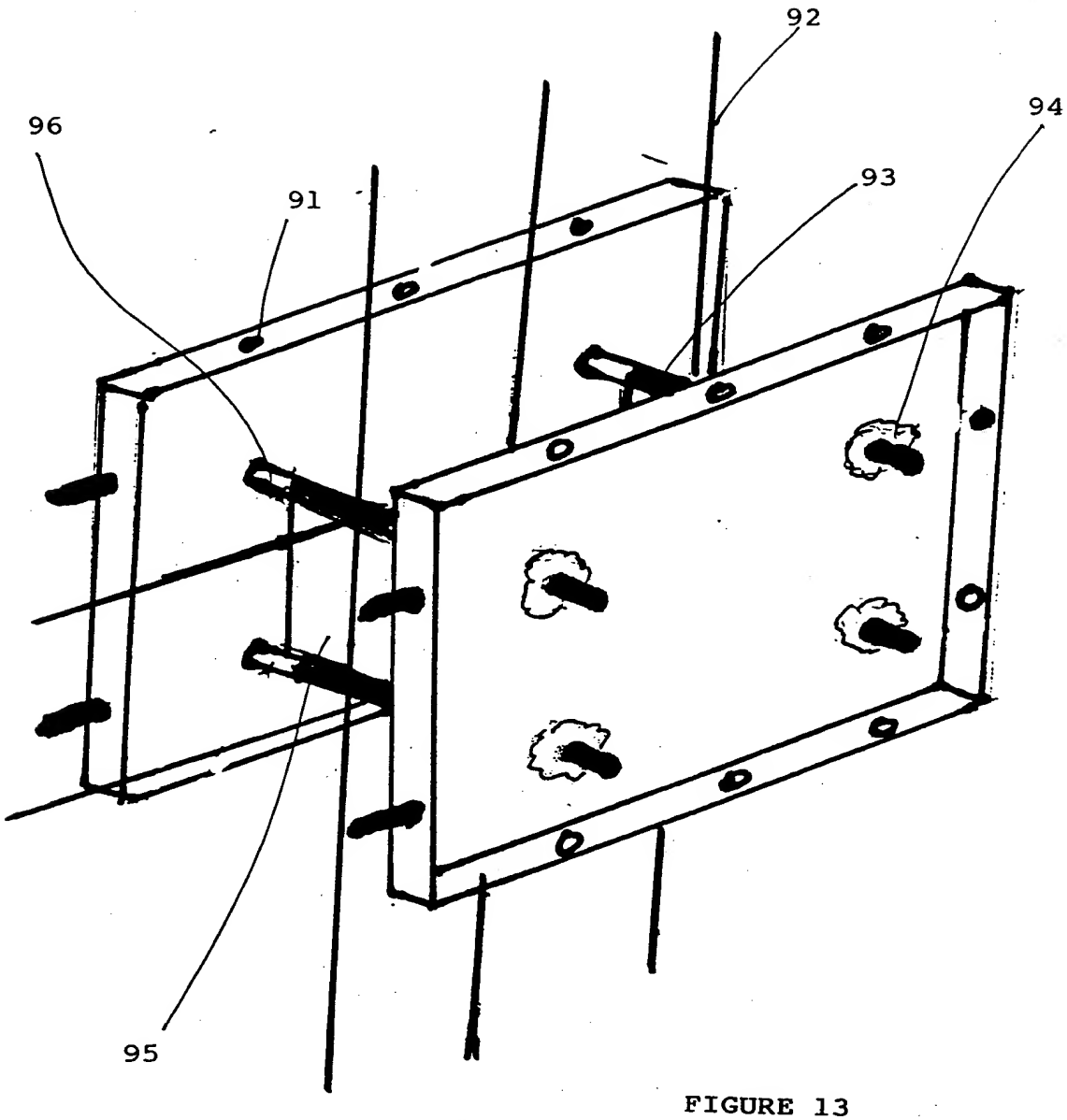

FIGURE 13

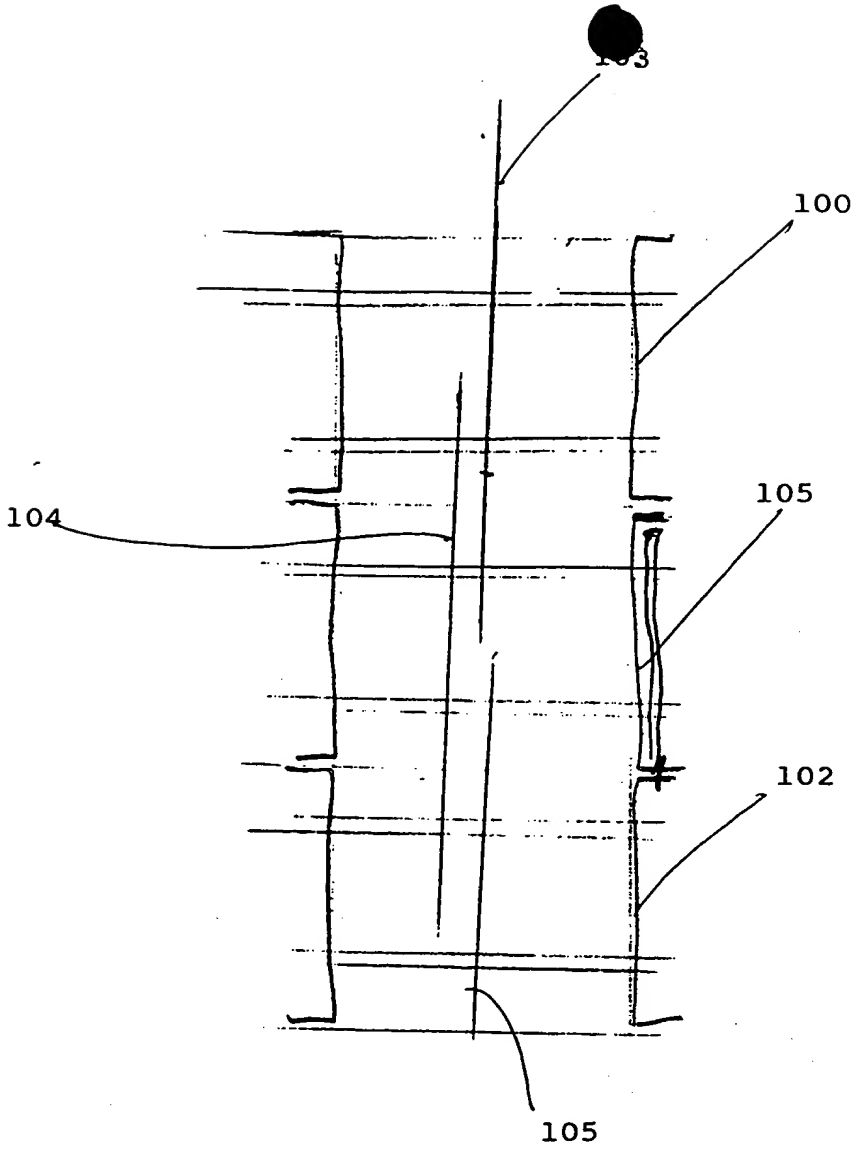

FIGURE 14

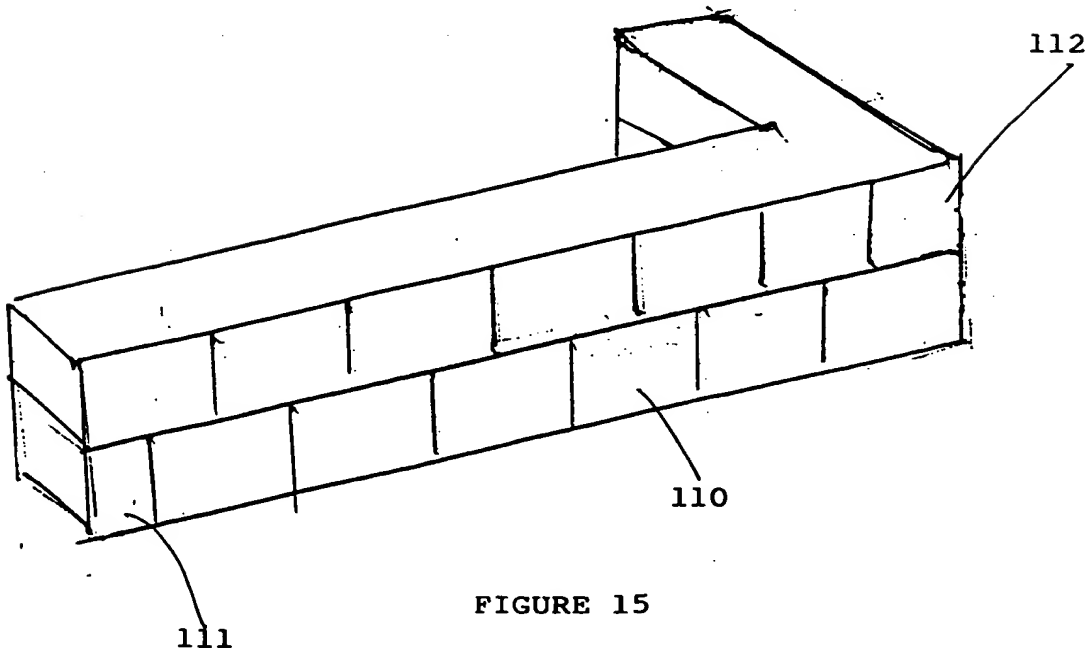

FIGURE 15

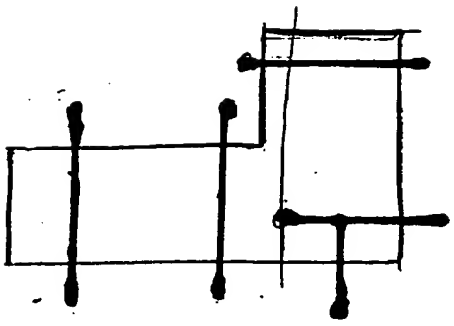

FIGURE 16

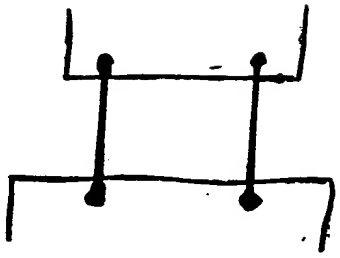

FIGURE 17

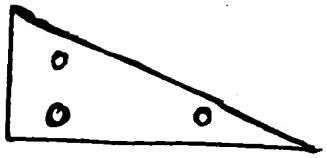

FIGURE 18